CLAIMS

1   1.   A system for managing ink information in a computer system having a pen-based
2   input tablet, the system comprising:
3   a pen driver coupled to the pen-based input/display tablet and configured to col-
4   lect and organize the ink information entered at the pen-based input tablet into ink
5   strokes;
6   an ink memory area organized into one or more ink phrase data structures; and
7   an ink manager coupled to the pen driver for receiving the ink strokes, the ink
8   manager having an ink phrase termination engine configured to examine the ink informa-
9   tion collected by the pen driver and, upon detecting the occurrence of an ink phrase ter-
10   mination event, to identify a respective end of an ink phrase to the ink manager,
11   whereby the ink manager stores the ink strokes received prior to the ink phrase
12   termination event in a selected ink phrase data structure.

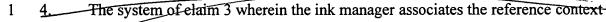1   2.   The system of claim 1 wherein
2   the ink information entered at the pen-based input tablet is associated with a client
3   application, and
4   the ink manager, in response to the occurrence of an ink phrase termination event,
5   is configured to pass the un-recognized ink strokes of the respective ink phrase to the cli-
6   ent application.

1   3.   The system of claim 2 wherein the ink manager, in response to receiving from the
2   client application a reference context affiliated with the un-recognized ink strokes of the
3   ink phrase, associates the reference context with the ink strokes.

1   4.   The system of claim 3 wherein the ink manager associates the reference context
2   with the un-recognized ink strokes by appending the reference context to the selected ink
3   phrase data structure.

1   ~~5.   The system of claim 2 wherein the ink phrase termination engine is configured to~~

2   initiate a time-out for each ink stroke and further wherein the termination engine identi-

3   fies the occurrence of an ink phrase termination event when the time-out expires before

4   the next sequential ink stroke is detected.

1   6.   The system of claim 5 wherein the time-out has a value that is settable by a user

2   of the computer system.

1   7.   The system of claim 5 wherein the pen-based input tablet has a surface and the

2   ink information generated by the tablet includes out-of-proximity data corresponding to

3   the pen being lifted above the surface of the tablet, and further wherein the termination

4   engine detects the occurrence of an ink phrase termination event upon detecting out-of-

5   proximity data from the tablet.

1   8.   The system of claim 2 further comprising:

2   one or more handwriting recognition engines for generating hypotheses based on

3   the ink information entered at the pen-based tablet; and

4   a handwriting recognition manager coupled to both the ink manager and the one

5   or more handwriting recognition engines, the handwriting recognition manager config-

6   ured and arranged to coordinate operation of the one or more handwriting recognition

7   engines, wherein

8   the ink strokes received at the ink manager are passed to the handwriting

9   recognition manager, and

10   the ink manager notifies the handwriting recognition manager of the oc-

11 currence of each ink phrase termination event and, in response, the handwriting

12 recognition manager directs a selected handwriting recognition engine to generate

13 one or more hypotheses for the ink strokes corresponding to the respective ink

14 phrase.

1   9.   The system of claim 8 wherein the handwriting recognition manager in coopera-

2   tion with the selected handwriting recognition engine employs a word segmentation

3   model to the ink strokes as they are received by the ink manager and, in response to de-

4   termining that a given ink stroke represents a new word, is permitted to issue an ink

5   phrase termination signal to the ink manager.

1   10.   The system of claim 8 wherein

2   the client application is configured to define at least one data entry field for dis-

3   play on the tablet and to establish corresponding boundary coordinates for the at least one

4   data entry field, and

5   the termination engine identifies the occurrence of an ink phrase termination

6   event when an ink stroke or portion thereof is outside of the boundary coordinates for the

7   at least one data entry field.

1   11.   The system of claim 8 wherein the one or more hypotheses are provided to the

2   client application.

1   12.   The system of claim 8 wherein the ink manager

2   in response to receiving from the client application a reference context affiliated

3   with the un-recognized ink strokes of the ink phrase, associates the reference context with

4   the ink strokes, and

5   in response to a request by the client application, returns the affiliated reference

6   context to the client application together with the one or more hypotheses.

1   13.   The system of claim 8 wherein, in response to receiving an indication that the cli-

2   ent application has consumed the un-recognized ink strokes, the ink manager directs the

3   handwriting recognition manager not to generate one or more hypotheses for the ink

4   strokes.

1   14.   The system of claim 8 wherein

2   in response to receiving the un-recognized ink strokes, the client application es-

3   tablishes a corresponding recognition context for the ink strokes, and

4   the handwriting recognition manager receives the recognition context and directs

5 the selected handwriting recognition engine to utilize the recognition context in generat-

6 ing the one or more hypotheses.

1 15. The system of claim 14 wherein the one or more hypotheses generated by the se-

2 lected handwriting recognition engine utilizing the recognition context from the client

3 application are provided to the client application.

1 16. A method for managing ink information in a computer system having a pen-based

2 input tablet that may include an integrated display for generating ink information as a pen

3 is moved across the tablet, the method comprising the steps of:

4   receiving the ink information generated by the input tablet;

5   identifying when the pen is lifted from the tablet so as to organize the ink infor-

6 mation into corresponding ink strokes; and

7   organizing the ink strokes into one or more ink phrases as defined by one or more

8 ink phrase termination events.

1 17. The method of claim 16 wherein the step of organizing comprises the steps of:

2   examining the ink information to determine whether an ink phrase termination

3 event has occurred; and

4   in response to the occurrence of an ink phrase termination event, segregating the

5 ink strokes received prior to the termination event in a designated ink phrase data struc-

6 ture.

1 18. The method of claim 17 wherein the ink information entered at the tablet is asso-

2 ciated with a client application, the method further comprising the step of optionally

3 passing the un-recognized ink strokes of the respective ink phrase to the client application

4 in response to the ink phrase termination event.

1   19.   The method of claim 18 further comprising the step of, in response to receiving a

2   reference context from the client application affiliated with the un-recognized ink strokes

3   of the ink phrase, associating the reference context with the ink strokes.

1   20.   The method of claim 19 wherein the reference context is associated with the re-

2   spective ink phrase by appending the reference context to the designated ink phrase data

3   structure.

1   21.   The method of claim 17 wherein the ink information enter at the tablet is associ-

2   ated with a client application, the method further comprising the steps of:

3   generating one or more recognition hypotheses for the ink strokes of the ink

4   phrase data structure; and

5   passing the one or more recognition hypotheses to the client application together

6   with the respective reference context.

1   22.   The method of claim 17 wherein the ink information from the input tablet further

2   includes out-of-proximity data which corresponds to the pen being lifted above a surface

3   of the tablet, the method further comprising the steps of:

4   examining the ink information to detect out-of-proximity data;

5   identifying the occurrence of an ink phrase termination event in response to de-

6   tecting out-of-proximity data.

1   23.   The method of claim 17 wherein the ink information entered at the tablet is asso-

2   ciated with a client application, and the client application defines a form for display on

3   the tablet, the form having one or more data entry fields for receiving handwritten infor-

4   mation, the method further comprising the steps of:

5   receiving a set of bounding coordinates established by the client application for

6   the one or more data entry fields;

7   comparing the ink information from the input tablet with the bounding coordi-

8   nates of the one or more data entry fields; and

9   ~~identifying the occurrence of an ink phrase termination event in response to de-~~

10   tecting ink information moving outside of the bounding coordinates for at least one of the

11   one or more data entry fields.

1   24.   The method of claim 17 wherein the computer system includes at least one recog-

2   nition engine, the method further comprising the steps of:

3   optionally configuring the recognition engine to apply a word segmentation model

4   to the ink strokes as they are organized; and

5   identifying the occurrence of an ink phrase termination event when the word seg-

6   mentation model determines that a given ink stroke is part of a new word relative to an

7   immediately prior ink stroke.

1   25.   The method of claim 17 further comprising the steps of:

2   initiating a time-out mechanism upon receipt of each ink data point; and

3   identifying the occurrence of an ink phrase termination event when the time-out

4   expires prior to receiving a next sequential ink data point.

1   26.   The method of claim 25 wherein the ink information from the input tablet further

2   includes out-of-proximity data which corresponds to the pen being lifted above a surface

3   of the tablet, the method further comprising the steps of:

4   examining the ink information to detect out-of-proximity data;

5   identifying the occurrence of an ink phrase termination event in response to de-

6   tecting out-of-proximity data.

1   27.   A computer readable medium containing executable program instructions for or-

2   ganizing ink information generated by a pen-based input tablet as a pen moves across the

3   tablet, the executable program instructions comprising program instructions for:

4   receiving the ink information generated by the input tablet;

5   identifying when the pen is lifted from the tablet so as to organize the ink infor-

6   mation into corresponding ink strokes;

7   examining the ink information to determine whether an ink phrase termination

8   event has occurred; and

9   in response to the occurrence of an ink phrase termination event, segregating the

10   ink strokes received prior to the termination event in a designated ink phrase data struc-

11   ture.

1   28.   The computer readable medium of claim 27 wherein the ink information entered   •

2   at the tablet is associated with a client application, the medium further comprising pro-

3   gram instructions for passing the un-recognized ink strokes of the respective ink phrase to

4   the client application in response to the ink phrase termination event.

1   29.   The computer readable medium of claim 28 further comprising program instruc-

2   tions for, in response to receiving an indication that the client application has consumed

3   the un-recognized ink strokes, blocking recognition of the ink strokes.

1   30.   The computer readable medium of claim 28 further comprising program instruc-

2   tions for, in response to receiving a reference context from the client application affiliated

3   with the un-recognized ink strokes of the ink phrase, associating the reference context

4   with the ink strokes.

1   31.   The computer readable medium of claim 30 wherein the reference context is asso-

2   ciated with the ink strokes by appending the reference context to the designated ink

3   phrase data structure.

1   32.   The computer readable medium of claim 27 wherein the ink information entered

2   at the input tablet is associated with a client application, the computer readable medium

3   further comprising program instructions for:

4   generating one or more recognition hypotheses for the ink strokes of the ink

5   phrase data structure; and

6   passing the one or more recognition hypotheses to the client application.

1   ~~33.   The computer readable medium of claim 32 further comprising program instruc-~~

2   tions for:

3   in response to receiving a reference context from the client application affiliated

4   with the un-recognized in strokes of the ink phrase, associating the reference context with

5   the ink strokes; and

6   in response to a request from the client application, returning the reference con-

7   text to the client application along with the one or more recognition hypotheses.

1   34.   The computer readable medium of claim 32 wherein the client application estab-

2   lishes a recognition context in response to receiving the un-recognized ink strokes of the

3   ink phrase and the program instructions from generating one or more recognition hy-

4   potheses further comprise program instructions for utilizing the recognition context es-

5   tablished by the client application.

1   35.   The computer readable medium of claim 27 wherein the program instructions for

2   examining comprise program instructions for:

3   initiating a time-out mechanism upon receipt of each ink data point; and

4   identifying the occurrence of an ink phrase termination event when the time-out

5   expires prior to receiving a next sequential ink data point.

1   36.   The computer readable medium of claim 35 wherein the ink information further

2   includes out-of-proximity data which corresponds to the pen being lifted above a surface

3   of the tablet, and the program instructions for examining further comprise program in-

4   structions for:

5   examining the ink information to detect out-of-proximity data;

6   identifying the occurrence of an ink phrase termination event in response to de-

7   tecting out-of-proximity data.